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Episodic and Chronic Nutrient Loading Effects on Cyanobacteria and Cyanotoxin Concentrations During Harmful Algal Blooms

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Eutrophication is the process in which excessive nutrients, primarily nitrogen and phosphorus, enter a body of water resulting in a rapid growth in population and density of phytoplankton. One type of phytoplankton made more concentrated during eutrophication is cyanobacteria. Some cyanobacteria can produce classes of cyanotoxins including microcystin and cylindrospermopsin. These cyanotoxins can have many negative impacts on both aquatic ecosystems and human health. The objective of this research is to determine the effects chronic and episodic nutrient loading have on cyanobacteria and the resultant cyanotoxin concentrations across four water bodies (Crow Pond in Williamsburg Missouri, Stephens Lake in Columbia Missouri, Lake 3 in Winnipeg, Manitoba and Pike Lake in Saskatoon, Saskatchewan). We simulated chronic loading by adding small amounts of nutrients (nitrogen and phosphorus) over a six-day period in a nutrient simulation experiment. Episodic loading was simulated by adding a large spike of nutrients to lake water on the first day only of the nine-day experiment. At the end of the experiment, we analyzed sample water for chlorophyll-a and phycocyanin concentrations as proxies for phytoplankton and cyanobacteria, respectively, as well as microcystin and cylindrospermopsin concentrations. This research is important to better understand how cyanobacteria respond to different types of external nutrient inputs, helping to understand how fresh water bodies might be impacted in the future as episodic events such as seasonal flooding become more severe.